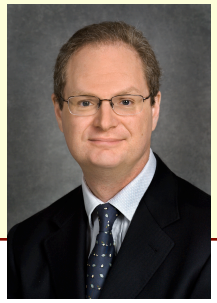
Materials Safety

Student Injured in Peroxide Explosion

A Message from Rick Kelly

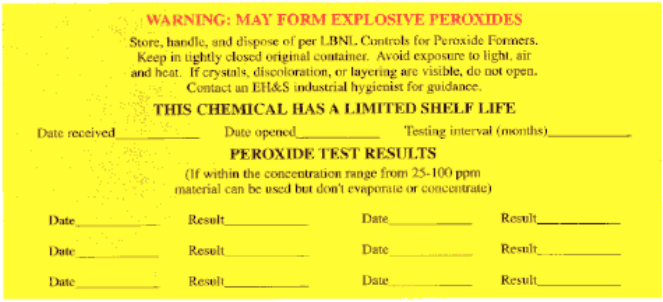
Explosions caused by peroxidized solvents are completely avoidable with a little education and attention to testing and labeling. Please make sure you are properly managing these materials in your laboratories.



—Paul Alivisatos, Division Director

Incident

Recently, there was an explosion involving a distillation apparatus in an MSD laboratory in Latimer Hall that injured an undergraduate student. The student was distilling a mixture containing tetrohydrofuran (THF) and diethyl ether at the time of the explosion. The preliminary incident investigation determined that the explosion was likely caused by the use of peroxidized THF in the distillation.



WARNING: MAY FORM EXPLOSIVE PEROXIDES

Store, handle, and dispose of per LBNL Controls for Peroxide Formers. Keep in tightly closed original container. Avoid exposure to light, air and heat. If crystals, discoloration, or layering are visible, do not open. Contact an EH&S industrial hygienist for guidance.

THIS CHEMICAL HAS A LIMITED SHELF LIFE

Date received_____ Date opened_____ Testing interval (months)_____

PEROXIDE TEST RESULTS

(If within the concentration range from 25-100 ppm material can be used but don't evaporate or concentrate)

Date_____ Result_____ Date_____ Result_____

Date_____ Result_____ Date_____ Result_____

Date_____ Result_____ Date_____ Result_____

Discussion

A variety of organic chemicals, (not limited to ethers), have a propensity to react with oxygen in air to form peroxide derivatives. Over time, these peroxides accumulate in the parent chemical. Distillation further concentrates the peroxides and at some point the mixture explodes violently. A much smaller number of chemicals can peroxidize and explode without evaporation of the parent material, potentially during handling of the chemical container. Diisopropyl ether is most notorious in this regard.

Some very common solvents are subject to peroxidation. 2-propanol, also called isopropanol or IPA can peroxidize and has resulted in a number of laboratory explosions when the solvent was distilled. Often chemicals that peroxidize readily are sold with oxidation inhibitors. These inhibitors work well until they are exhausted, at which point the solvent behaves like an uninhibited material.

LBNL policy requires that containers of peroxidizable solvent be specially labeled, dated when received and when opened and tested annually for peroxides (quarterly testing is required for a few solvents). When the peroxide concentration approaches 100 ppm, the solvent should be disposed of as hazardous waste. Very old, legacy peroxidizable chemicals should not be tested or handled—contact Rick Kelly at x4088)

Additional information on the safe handling of peroxidizable chemicals is available at:

LBNL- http://www.lbl.gov/ehs/chsptrain/html/peroxide.htm

UCB- http://www.ehs.berkeley.edu/pubs/guidelines/pecguidelines.html#introduction

The full **Lessons Learned** describing this incident on campus is available at: http://www.ehs.berkeley.edu/lessonslearned/labslessons4.html

To borrow a kit that includes labels, test strips and other equipment for testing solvents, contact Paul Johnson at x5810 (LBNL only). On campus call EH&S at 642-3073 for additional help and guidance.

The above label is an LBNL label for Peroxidizable Chemicals, (not UCB label).

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